WHAT IS CLAIMED IS:

1. A thin film forming apparatus containing raw material supply sources, namely a sputter film forming source and a reactive gas supply source in a same vacuum chamber such that both the sources oppose a substrate, wherein a main evacuation port for evacuating the vacuum chamber is disposed closer to the reactive gas supply source between both the sources, the thin film forming apparatus further including a control system which executes a reaction process of operating the reactive gas supply source provided with a reactive gas introduction port and a reactive gas exhaust port and a film forming process of operating the sputter film forming source provided with a sputter gas introduction port.

2. The thin film forming apparatus according to claim 1 wherein the control system executes both the processes alternately by starting any one of the reaction process and the film forming process after the other process ends.

3. The thin film forming apparatus according to claim 1 wherein with the reaction process maintained, the control apparatus repeats the film forming process with a time interval.

4. The thin film forming apparatus according to claim 1 wherein the reactive gas source is constituted of a reactive gas plasma generator and the main evacuation port and the reactive gas exhaust port disposed near the plasma generator are provided each with conductance adjusting valve.

5. A thin film forming method using the thin film forming

apparatus according to claim 2 wherein with sputter gas and reactive gas supplied continuously at the time of film formation, of both the raw material supplying sources, the film forming process to be carried out by operating the sputter film forming source and the reaction process to be carried out by operating the reactive gas source are executed alternately by starting any one process thereof after the other process ends.

6. A thin film forming method using the thin film forming apparatus according to claim 3 wherein with the film forming process to be carried out by operating the sputter film forming source maintained, the reaction process to be carried out by operating the reactive gas source is executed repeatedly with a time interval.

7. A thin film forming method wherein the control system of the thin film forming apparatus according to claim 1 memorizes reactive gas flow rate under a predetermined sputter gas flow rate and sputter film forming rates comprised of three modes of high-, middle- and low-speeds, namely, high-speed metallic species film forming mode, low-speed compound species film forming mode and intermediate film forming mode, which are selected depending on the reactive gas flow rate, as reference data and at the time of the film formation under the predetermined sputter gas flow rate, the reactive gas flow rate and the sputter gas flow rate corresponding to the high-speed metallic species film forming modes are selected and then both the gas flow rates are controlled so as to maintain

a ratio between the selected both gas flow rates, namely reactive gas flow rate and sputter gas flow rate, thereby making it possible to select a condition in which the film forming process is more dominant than the reaction process or to select a condition in which the reaction process is more dominant than the film forming process.

8. The thin film forming method according to claim 5 wherein the growth of thin film thickness in the film forming process is less than 20Å in each film forming process.

9. The thin film forming method according to claim 6 wherein the growth of thin film thickness in the film forming process is less than 20Å in each film forming process.

10. The thin film forming method according to claim 7 wherein the growth of thin film thickness in the film forming process is less than 20Å in each film forming process.